dinated things than they classify and coordinate.

May it not be because of the inexhaustible bounty of nature, and not because comprehension is knowledge, that we can never know anything as it really is?

Each new encyclopedia is bigger than the one before, and so, no doubt, it will be to the end. If knowledge were nothing more than comprehension, or the analysis and classification of facts, the progress of science should be bringing us nearer to universal knowledge, but each new discovery puts it farther from our grasp than before, and they who know most are most convinced of its unattainableness, not because the reality of things is unknowable, but because of the innumerable multitude of things knowable.

W. K. Brooks.

Johns Hopkins University.

*THIRD ANNUAL MEETING OF THE BOTANISTS OF THE CENTRAL STATES.**

FIRST SESSION, HULL BOTANICAL LABORATORY, ROOM 13, TUESDAY, 9 A.M.

The meeting was called to order by C. R. Barnes. About seventy botanists were present. J. M. Coulter was elected chairman and Albert Schneider secretary. After a few preliminary remarks the chairman called for the reading of scientific papers, which were presented as follows:

Charles F. Millspaugh: 'The Clothing of an Islet.' (No abstract furnished.) Illustrated by lantern slides.

George H. Shull: 'Variations in Several Species of *Aster*.' Counts were made of bracts, rays and disk florets in *Aster Shortii* Hook., *A. Novæ-Angliæ* L., *A. puniceus* L., and *A. prenanthoides* Mühl. The result of these counts gave but a single instance of a maximum falling on a member of the Fibonacci-series, 3, 5, 8, 13, 21, etc., the rays of *Aster Shortii* presenting a strong mode on 13; a general result giving but slight confirmation of Ludwig's results on various other Compositæ. The counting of the parts of heads collected on September 27, 30, October 4 and 8, from a single small plot of *Aster prenanthoides*, and comprising collectively all the heads produced in one season, showed, alike in bracts, rays and disk florets, a constant fall in the mean number and a corresponding shifting of the modes from the beginning to the end of the flowering season. This fact must be taken into account in the determination of place modes. There is a close correlation between the number of rays and the number of bracts, due to the fact that the rays are axillary to the inner bracts. In the four species studied the degree of imbrication of the bracts, and also the difference in form and size between the outer and inner bracts of the head are proportional to the number of bracts which bear no rays in their axils. A complete account of these studies will appear in the *American Naturalist* for February, 1902.

Edwin B. Copeland: 'The Influence of Metallic Poisons on Respiration.' Experiments with *Elodea, Callitriche,* a crucifer, fish and frog larvæ, using as stimulants copper, zinc, cadmium, silver and mercury, agree in showing that the respiration may be stimulated by a small fraction of a fatal concentration. With increasing concentration the acceleration of CO_2-evolution is greater, sometimes reaching above 25 times the normal. Evolution of CO_2 continues undiminished after plasmolysis is suspended by the poison. Copper and zinc cause the evolution of considerable CO_2 from boiled *Elodea*.

Frederick C. Newcombe: 'The Sensory Area of the Roots of Land Plants.' In the roots of land plants, sensitiveness to exter-

* Held in connection with the meeting of the American Society of Naturalists, at the University of Chicago, December 31, 1901, to January 2, 1902.

nal stimuli has been considered to be confined to the apex and to the elongating zone. The elongating zone in nearly all species is confined to the first 10 mm. of the apex. In studying the phenomena of rheotropism it was found that the region of the root posterior to the elongating zone is sensitive as well as the elongating zone itself. To determine the location of the sensory tissue, various parts of the root were shielded from the flow of the water by enclosure in glass tubes. The roots of the radish, white mustard, buckwheat, sunflower, and popcorn gave good rheotropic curves when stimulated at a distance of 10 mm. to 15 mm. from the limit of the elongating zone.

FRANCIS RAMALEY: 'Mesa Vegetation.' The plants of these long, gently sloping, flat-topped ridges are distributed in characteristic fashion, depending upon the various edaphic conditions presented by different slopes and exposures. Probably the most interesting feature to be noted is the distribution of trees and shrubs. These plants are present on the tops of the mesas at their western ends, absent farther east because of dryness, present on the north and absent on the south slopes. On the south slopes shrubs occur near the top. This portion of the slope, in most hills the driest, is here somewhat moist because the snow remains late in the spring on the flat tops, and in melting the water trickles down the sides of the hill and is absorbed near the top. There is thus more moisture near the top than farther down, and the occurrence of a fringe of shrubs and trees at the top is thus explained. Illustrated by lantern slides.

D. M. MOTTIER: 'The Behavior of the Chromosomes in the Spore Mother Cells of Higher Plants and the homology of the Pollen and Embryo-sac Mother Cells.' The author discussed the behavior of the chromosomes in the pollen mother cells of the species of *Lilium, Podophyllum peltatum* and *Tradescantia Virginica,* and in the embryo-sac of *Lilium Martagon,* with the following results: The earlier view of Farmer and Strasburger, that a double longitudinal division of the chromosomes takes place during the first mitosis, is confirmed. The second longitudinal splitting takes place in a plane at right angles to the first. This is clearly seen during metakinesis; it may occur earlier. There is, therefore, no longitudinal fission of the chromatin spirem during the second mitosis, and no reduction division in the sense of Weismann. In the reconstruction of the daughter nucleus the granddaughter chromosomes unite to form a single chromatin spirem. In *Tradescantia* especially, the granddaughter segments tend to reticulate so that an irregular spirem is the result, and the daughter nucleus approaches the structure of the resting stage. The identity of the individual chromosomes is lost in the daughter nucleus. The first two mitoses in the embryo-sac mother cell are like in character to those in the pollen mother cell, and consequently the micro- and macrospore mother cells are homologous. The type of development of the embryo-sac in which the heterotypic and homotypic mitoses result in four potential macrospores, as for example in *Helleborus,* is regarded as the more primitive, while that found in *Lilium* is considered as a derived form. No case is known in which the pollen mother cell develops directly into the pollen spore. Illustrated by lantern slides.

SECOND SESSION, 2 P.M.

Meeting called to order by the chairman. About seventy-five were present. The chairman read the following message:

Society of Plant Morphology and Physiology in session at Columbia sends greetings to Botanists of Central States at Chicago.

ERWIN F. SMITH, *President,*
WILLIAM F. GANONG, *Secretary.*

A return message was ordered sent to President Erwin F. Smith. The secretary was directed to arrange for contiguous seats for botanists at the annual dinner. Charles F. Millspaugh extended a formal invitation to all botanists to visit the Field Columbian Museum.

The reading of papers was resumed:

Conway MacMillan: 'A Marine Biological Station on the Straits of Fuca.' A series of lantern slides were shown illustrating the buildings and surroundings of the Minnesota Seaside Biological Station on the Straits of Fuca. Among the views were a number illustrating the kelp formation of the Vancouver coast and several photomicrographs of the anatomy of *Ptery-gophora californica* Rupr., a plant upon which particular study had been expended. The excellence of the locality as a field for station activities was pointed out and some of the plans for the coming summer were indicated.

Harold L. Lyon: 'The Phylogeny of the Cotyledon.' Modern researches in angiospermic embryology have shown the prevalent foliar theory of cotyledons to be untenable. A careful survey of the investigations already recorded has led to the following conclusions. (*a*) The typical embryos of the Pteridophytes and Angiosperms differentiate into three primary members—the cotyledon, stem and root. (*b*) Cotyledons are not arrested leaves, but are primarily haustorial organs originating phylogenetically as the nursing-foot in the Bryophytes and persisting throughout the higher plants. (*c*) The monocotyledonous condition is the primitive one and prevails in the Bryophytes, Pteridophytes, Monocotyls and some Gymnosperms. The two (sometimes more) cotyledons of the Dicotyls are jointly the homologue of the single cotyledon of the Monocotyls. (*d*) The cotyledon always occurs at the base of the primary stem. (*e*) The hypocotyl is a structure peculiar to the Angiosperms, being differentiated between the primary stem and root. (*f*) The so-called cotyledons of the Pteridophytes, and Gymnosperms, with the exception of *Ginkgo* and the Cycads, are true foliage-leaves.

E. Mead Wilcox: 'Valvular Torsion as a Means of Seed-dispersal in *Ricinus*.' For the purpose of securing accurate data regarding the efficiency of valvular torsion for seed-dispersal in *Ricinus*, a plant was selected, growing in an open field. The ground about this plant was divided into four quadrants designated, N.E., S.E., S.W. and N.W. The surface was frequently cultivated so that the seeds would not be blown about by winds after falling. The following table shows the distances to which seeds were thrown, measured from the base of the plant. The plant was 104 cm. in height and the inflorescence, at maturity, was 36 cm. in length:

Distance from Center (cm.)	Number of Seeds.				Totals.
	N.E.	S.E.	S.W.	N.W.	
0–49	9	29	19	11	68
50–99	8	12	16	9	45
100–149	3	7	7	14	31
150–199	5	6	4	3	18
200–249	4	6	4	3	17
250–299	1	2	1	2	6
300–349	0	2	2	0	4
Totals.	30	64	53	42	189

The greatest distance to which any seed was thrown was 325 cm. On 12 of the 19 days upon which observations were made the wind was from the south.

Cyrus A. King: 'Fertilization and Some Accompanying Phenomena in *Araiospora pulchra*, one of the Aquatic Phycomycetes.' Araiospora has the habit of *Saprolegnia*, growing attached to twigs in water. Both genus and species were established by Thaxter in 1896. The sexual organs resemble those of the Peronosporineæ.

The oogonia when cut off contain about fifty nuclei, which move toward the periphery while the interior is still a coarse cytoplasmic mesh-work. Patches of fine meshed cytoplasm now arise at various places in the oogonium; these later fuse into one central irregular mass which never loses its mesh-like character. This central structure, which corresponds to bodies previously observed in the Peronosporineæ and *Pythium*, reaches its highest development at the time the sperm nucleus enters. Soon afterwards it begins to spread out into the peripheral ooplasm. Just before the separation of egg from periplasm, the nuclei probably all divide once, mitotically. The egg, when ripe, consists of this previously described central area, which now has a female nucleus imbedded in it, surrounded by a coarse, uniformly vacuolate peripheral portion. Enclosing the egg, though sharply marked off from it, is the periplasm which, at this time, is divided anticlinally into a single layer of cells.

No such structure as an antheridial tube was seen. The fertilizing tube is entirely of oogonial origin. The protoplasm in contact with the oogonial wall where the antheridium is appressed, and where the oogonial papilla is developed, always remains with the ooplasm. Consequently, the plasma membrane of the periplasm, as it lays down a wall between it and the ooplasm, builds the wall of the fertilizing tube. As soon as this tube is formed, the perforation is made by the papilla and a sperm nucleus and some cytoplasm are admitted. As the nuclei approach, both put out beaks which, at least in some cases, fuse. When the wall of the oospore is well developed the latter is binucleate. The important points in the paper are: (*a*) Fertilization takes place by the union of a single male and female nucleus. (*b*) An organ of attraction for the sexual nuclei arises in the early development of the oogonium and its origin, structure and fate is followed. (*c*) There is no such fertilization tube as is figured in related forms. The tube here is a conjugation tube and the opening a conjugation pore, as Harper has suggested in *Pyronema*. Illustrated by lantern slides.

FREDERICK DEFOREST HEALD: 'The Electrical Conductivity of Plant Juices.' Using the methods of physical chemistry, conductivity measurements were made for the juice expressed from the leaves, stems, roots, etc., of different plants. The following species were used: *Beta vulgaris, Solanum tuberosum, Allium cepa, Raphanus sativus, Nuphar advena, Cucumis sativus, Amarantus retroflexus* and *Portulaca oleracea*. Ash determinations were also made for the juices used and the ash redissolved in distilled water and diluted up to the original volume of the juice from which it was obtained. Specific conductivity determinations were made for the ash solutions. The following conclusions were drawn from the various determinations. (*a*) Plant juices are comparatively good conductors, the conductivity being due in large measure to the dissolved mineral substances, while the organic compounds play a minor part. (*b*) The specific conductivity of the juice obtained from the roots of plants is always considerably less than that of the juice obtained from the subaerial parts of the plant. (*c*) The specific conductivity generally increases progressively from the root upward, although in some cases the sap from the stem has a higher conductivity than that from the leaves. (*d*) In the majority of cases the specific conductivity is a rough measure of the relative amount of ash present in different parts of the plant. Illustrated by lantern slides.

H. G. TIMBERLAKE: 'Starch Formation in *Cladophora*.' The process of starch formation in *Cladophora* was described as oc-

curring in essentially the same manner as in *Hydrodictyon* (*Annals of Botany*, Dec., 1901). In material killed in various killing fluids, sectioned with a microtome and stained with the safranin gentian-violet orange mixture, stages in the transformation of a portion of a pyrenoid into a starch grain were observed. All the starch grains arise in this manner. There is no distinction in origin between the so-called pyrenoid starch and stroma starch. In these cells starch cannot be said to be the first visible product of photosynthesis, since it is formed from a visible proteid body, the pyrenoid.

B. E. Livingston: 'Influence of the Osmotic Pressure of the Surrounding Medium upon the Growth and Production of Living Organisms.' A change in the surrounding solution may result in either a physical or a chemical change in the solution contained within the organism. By physical change is to be understood a mere change in general concentration, brought about by absorption or extraction of water. A strong solution will extract water from the organism, a weak one will allow it to be absorbed. By chemical change is meant changes caused by absorption or extraction of solute particles. Change in the water content of the protoplasm may be directly effective by causing a change in its physical properties. For instance, if water is extracted, the viscosity of the protoplasm must be increased. The same change in water content may result in a change in the chemical activity of the protoplasmic solution, since chemical activity, in general, depends upon the concentration of the solution involved. How it comes about is not known, but a review of the literature of experiments upon animals and plants shows that growth is very much retarded by an external solution which extracts water. Especially is the elongation of cells retarded. The only experiment dealing with the effect of external solutions upon reproduction is that of the author upon *Stigeoclonium*. Zoospores fail to be produced in strong solutions, but are produced in large numbers in weak ones.

H. G. Timberlake: 'Cell Division in *Riccia fluitans*.' Attention was called to the fact that the cells in the region of the growing point afford excellent material for the study of nuclear and cell division in the liverworts. A distinct cell plate, whose origin and development are the same as that of the spermatophytes, can be made out with very great certainty.

Howard S. Reed: 'The Ecology of a Glacial Lake.' The lake studied is the remnant of a lake which came into existence at the close of the second glacial period; at that time its extent was considerably greater than at present. As the water level slowly fell, aquatic and semi-aquatic species had the first opportunity to get a foothold and become established upon the land thus uncovered; as a result, the flora of the region shows a scarcity of distinctly terrestrial plants. The plants at the lake are grouped in five concentric zones occupying all the lake bottom less than twenty feet under water and the shores. The zones which have been named from their characteristic plants are as follows: (1) *Potamogeton*, (2) *Nuphar*, (3) *Carex* and *Sphagnum*, (4) *Salix* and *Populus*, (5) *Gramineæ* and *Compositæ*. The position of these zones is not permanent; they are steadily encroaching upon the lake and filling it with the soil they produce. The most important agencies in causing the advance of the zones into the water are soil, light and the morphology of the plants. As the plants make the lake more and more shallow they make it more unfit for themselves and fit for the succeeding zone. The struggle in each zone is less successful on

the landward than on the lakeward side of that zone. The plants engaged in this severe struggle show a marked tendency to mass themselves in solid ranks. Illustrated by lantern slides. The paper is soon to be published in full.

THIRD SESSION, WEDNESDAY, 9 A.M.

The meeting was called to order by the chairman, and without further preliminaries the reading of papers was resumed.

C. E. ALLEN: 'Spindle Formation in the Pollen Mother-Cells of *Larix*.' At an early stage in the prophases of the first nuclear division, fibrous material is present in considerable quantity in the cytoplasm, at first staining with the triple stain like the rest of the cytoplasm. Soon the fibrous material shows a tendency to stain deeply blue. It is now seen to form an irregular reticulum throughout the cytoplasm. The fibers gradually arrange themselves radially to the nucleus; the shorter ones grow in length until a complete system of radial fibers is formed, connecting the nuclear membrane with the plasma membrane. These fibers now fold over, so that many of them come to lie parallel with the nuclear membrane, and in time to form a dense felted layer immediately outside the nucleus. From the felted layer, the multipolar spindle and finally the bipolar spindle are formed, substantially as described by Belajeff and Strasburger. The most important point brought out by the investigation is that there is a fibrous system whose history can be traced from a reticulated stage to that of the completed spindle. No centrosomes could be seen, and the possibility of their presence as cell organs or directive centers seems to be excluded. The changes in the arrangement of the fibrous system seem to be correlated with processes going on within the nucleus.

BRUCE FINK: 'Some Interesting Lichen Formations.' The author made some preliminary statements regarding our present knowledge as to factors upon which ecologic studies may be based. These factors are physical and chemical structures of substrata and the structure of lichen thalli. This introduction was followed by a discussion of some of the more common lichen formations, viz., those of smooth and rough bark, those of the boulders of our prairies, and those of calcareous pebbles or horizontally disposed calcareous rocks and calcareous earth.

H. C. COWLES: 'Ecological Problems connected with Alpine Vegetation.' Alpine problems, like all ecological problems, present two aspects, phytogeographic and morphological. Most previous field studies of alpine vegetation have failed to separate distinct phytogeographic ideas. Properly to interpret alpine conditions it is necessary to distinguish floristic distribution from ecological distribution. Again, ecological distribution has its climatic and edaphic aspects. Alpine conditions have been largely regarded as climatic, and most of the peculiarities of alpine plants, distributional as well as morphological, have been referred to atmospheric factors, such as light, temperature, moisture, air. Perhaps alpine plant forms are in the main to be regarded as the direct result of external atmospheric conditions, as Bonner has shown. The distribution of alpine plants, however, is apparently due in large degree to edaphic conditions. The timber line in general may probably be referred to atmospheric conditions, but the marked gaps and oscillations which usually occur are due in a large measure to soil relations. While xerophytes increase in the alpine parts of mountains, it is to be observed that edaphic as well as climatic factors become more xerophytic upwards. While

changes occur as one traces one type of edaphic formation upwards, these changes are far less marked than are those observed in passing from one edaphic formation to another. Alpine, as well as all ecological problems, can be ultimately settled only by experimentation, and in this great field Bonnier has led the way. The field study of ecology should be regarded chiefly in the light of furnishing an intelligent basis for experiment. Illustrated by lantern slides.

R. A. HARPER: 'Cell Division in Certain Blue-Green Algæ.' (No abstract furnished.)

C. R. BARNES: 'The Significance of Transpiration.' In this paper the author seeks to present a new point of view regarding transpiration, taking account of the extensive results of experimentation already attained. The purpose of transpiration is ordinarily held to be double: (*a*) to cause the influx to the leaves of a large quantity of water, that thereby a sufficient amount of mineral salts may be supplied to the leaves; (*b*) to concentrate the extremely dilute solutions thus brought to the leaves and so get rid of surplus water. These two phases of the function are held by the author to be, to some degree at least, mutually exclusive. The amount of salts absorbed is certainly dependent upon the living cortex of the rootlets and the mesophyll of the leaves. (For the purpose of the present discussion the xylem bundles may be conceived as furnishing no obstacle to water flow.) If the cortex be freely permeable, equilibrium in the distribution of any given salt will occur, assuming for a time no evaporation from the aerial parts. If then evaporation concentrates the solution the higher diffusion tension of that salt will tend to drive it to those regions where the diffusion tension is lower. This tendency, therefore, would operate against the further supply of that material to the leaves. If the cortical layers be not freely permeable, the amount absorbed is regulated wholly by protoplasmic activity and cannot be affected directly by the outside supply. The phenomena of selective absorption show that transpiration does not determine in these cases the amount of salts absorbed. The significance of transpiration is to be discovered by examining its origin and tracing its development. Under the present organization of plants exposure of wet cell walls to the atmosphere is indespensable for the solution of necessary gases, oxygen and carbon dioxid, the plant being debarred from waterproofing the cell wall so long as gas absorption is necessary. Transpiration is, therefore, considered as *unavoidable*, though in itself a constant menace to life and activity. Advantage has doubtless been taken of the xylem bundles to facilitate the movement of solutes, but there is no reason to think this essential. Transpiration also has become a protective factor with sun plants, whose temperature is thereby kept within reasonable bounds. (Since reading the paper the author has ascertained that in certain points his view of transpiration coincides with those expressed by Dr. C. E. Bessey in a paper on the function of stomata, published in SCIENCE, N. S. 7: 13–16. 1898.)

R. A. HARPER: 'Binucleate Cells in Certain Hymenomycetes.' (No abstract furnished. The paper is published in full in the *Botanical Gazette* 33: 1–25. *pl. 1.* 1902.)

JAMES B. POLLOCK: 'An Abnormal Development of the Prothallium of the Pollen Grain in *Picea excelsa*.' The author reported a case of a pollen grain of *Picea excelsa* in which there were four cells formed

in addition to the number usually present. These four additional cells lay in one row along the external wall of the pollen grain, between the partially disintegrated prothallial cells and the external wall, against which the first prothallial cell usually lies. The four additional cells averaged about half as large as the so-called body cell or spermatogenous cell, and the row of four was almost as long as the full width of the central portion of the pollen grain. Against the thin wall which divided the four extra cells from the large cell of the pollen grain, the cells which are usually present in the pollen grain of *Picea excelsa* were arranged in their usual manner. Two partially disintegrated prothallial cells were present, also the stalk cell and spermatogenous cell. Two interpretations are possible as to the meaning of the four extra cells: (*a*) They may show merely a spontaneous variation of the pollen grain—that is, a variation whose cause is wholly hidden in the present state of our knowledge. In this case the variation would have no special significance in the interpretation of homologies. (*b*) The four extra cells may represent a reversion to an ancestral form, and could properly be called a prothallium. If this view of the case is the correct one, all the rest of this pollen grain—that is, all that is usually present in the pollen grain—may well stand for a single antheridium, and the so-called prothallial cells are the partially disintegrated cells of the antheridium stalk. The ordinary pollen grain of *Picea excelsa* is then merely an antheridium and has no cells that may be called prothallium. In the nature of the case the proof of the latter interpretation is practically impossible, since only rarely will pollen grains be found to vary in this way. If many pollen grains should be found varying in just this same way the author would be inclined to accept the latter interpretation.

The following business was transacted:

Conway MacMillan presented the following resolution to be laid on the table until the final session: "*Resolved,* That this group hereby organize under the name of the Botanists of the Central States, and resolved, further, that the chairman be empowered to appoint a committee of three, including himself, which shall have full charge of organization, membership qualification and the program for one meeting in 1902 in case it is decided to convene during that year." After discussion the resolution was tabled for later consideration.

The secretary was asked to read a communication from W. G. Farlow, accompanying copies of the 'Third Report of the Committee on Securing Better Reviews of Botanical Literature,' which were then distributed to the botanists present. On request, William Trelease explained the progress in the organization of the International Association of Botanists and especially the plans for conducting the editorial work of the *Botanisches Centralblatt,* now the official publication of the Association. He explained also the financial plans for conducting the *Centralblatt.* It was explained that it was the plan of the *Centralblatt* to publish brief abstracts of all of the more important botanical papers, irrespective of authorship and without comment; prompt cooperation of authors and subeditors would accomplish this.

The discussion of the subject, 'Cooperation among research laboratories to avoid unnecessary duplication of work,' was opened by J. M. Coulter and participated in by R. A. Harper, William Trelease and E. E. Bogue.

In the afternoon the botanists met with the American Society of Naturalists and listened to the discussion on the relation of that Society to present and proposed scientific organizations.

FOURTH SESSION, THURSDAY, 10 A.M.

The meeting called to order by the chairman. The resolution of Conway MacMillan was taken from the table and discussed. After amendment it was adopted in this form: "*Resolved,* That this group hereby organize under the name of the Botanists of the Central States; and resolved, further, that the chairman be empowered to appoint a committee of three, including himself, which shall report to the next meeting of this body a plan of organization." The chairman accordingly appointed as such committee Conway MacMillan, D. M. Mottier and himself.

William Trelease called attention to the fact that as the American Association for the Advancement of Science and the American Society of Naturalists would meet at Washington, D. C., in January, 1903, it would be desirable for the Botanists of the Central States to convene there also at the same time. It was voted that the next meeting be held in Washington, in Convocation Week, 1903. Discussion continued as to the desirability of a general union of botanical societies to constitute a really national organization, thoroughly representative, and with autonomous local sections, *e. g.,* at present Atlantic and Central sections, and as soon as possible Pacific and Gulf sections. Such a plan of organization would combine regional convenience with national authority.

At the close of the discussion the reading of papers was continued.

CLIFTON D. HOWE: 'The Development of the Flora on a Delta Plain in Vermont.' A delta plain formed during or subsequent to the glacial period at the mouth of the Winooski river has been exposed by the gradual subsidence of Lake Champlain. The lake is now 240 feet below the general level of the delta plain. The first terrestrial flora of the plain was a sand beach flora which crossed the plain with the constantly receding beach. Then came plants which, by continually increasing the amount of humus, prepared the soil for the pitch pine (*Pinus rigida*) forest, now the controlling formation on the plain. The gentle slopes of the ravines in the now much dissected plain are controlled by a mesophytic forest of the maple-beech type. As the erosion brings the plain nearer a base level, conditions will become more and more favorable for the further extension of a mesophytic forest.

CHARLES F. HOTTES: 'Functions of the nucleolus in plants.' (No abstract furnished.)

H. N. WHITFORD: 'The Physiographic Ecology of a Sand Spit Near Cold Spring Harbor, Long Island.' (Read by title.)

J. M. WESTGATE: 'Genetic Development of the Vegetation on an Island in the Kansas River.' In this paper the author reports the results of four years' ecological study of an island in the Kansas river. The location of the island is such that the silt deposits are heavy, and as a consequence the development of the mesophytic flora from the xerophytic flora of the sandy border is rapid. Serial photographs and notes have recorded the more salient features of the changes from year to year. The succession of formations as the mesophytic conditions obtain have been largely verified by comparative studies along the Kansas and other rivers of the Mississippi basin.

All of the botanical papers announced on the printed program were read, with the exception of the one by the chairman, which he passed by. The abstract is as follows:

JOHN M. COULTER: 'Parthenogenesis in Seed Plants.' The term is used in its strict sense as meaning the segmentation of an

unfertilized egg. Two clear cases of parthenogenesis among seed plants have been published, namely, that of *Antennaria,* by Juel, in 1898, and that of certain species of *Alchemilla,* by Murbeck, in 1901. Dr. J. B. Overton, in a thesis about to be published in the *Botanical Gazette,* announces the same phenomenon in *Thalictrum purpurascens.* In this last case the segmentation of fertilized and unfertilized eggs was compared. In the former case the segmentation occurs synchronously with that of the definitive nucleus, while the unfertilized egg delays division until the very numerous free endosperm nuclei are parietally placed. It is surrounded by a very dense mass of granular cytoplasm, and associated with its segmentation are striking changes in the zone of cytoplasm immediately in contact with the egg. Overton suggests the possibility of an enzyme being secreted by the egg, and a digestion of the cytoplasm. If this be the case, substances may well be developed in the changing cytoplasm that will bring about those physical changes in the egg that induce segmentation. Observations in other species were mentioned that indicate the possibility that parthenogenesis may be a much more common phenomenon among seed plants than has been supposed. The suggestion was also made that in any embryo sac rich in cytoplasm a parthenogenetic embryo may arise.

The chairman called attention to the model herbarium and the collection of economic plant products at the Field Columbian Museum, to which the visiting botanists would be admitted free on presentation of their registration cards. In conclusion he spoke of the interest in the meetings, as evidenced by the large number who attended all of the sessions, and of the fact that this third successful meeting of the Botanists of the Central States, a body without organization, showed that its success depended upon the spontaneous interest taken in botanical work.

ALBERT SCHNEIDER,
Secretary.

SCIENTIFIC BOOKS.

Towers and Tanks for Water Works. By J. N. HAZELHURST, Mem. Am. Soc. C. E. New York, John Wiley & Sons. 8vo. Pp. 216; 19 illustrations.

In this work the author has evidently aimed not only to discuss those features of structural design peculiar to stand-pipe and tank construction, but also to include sufficient information relating to some of the more general matters as to make the volume complete in itself. Out of the eleven chapters of the book he thus devotes two chapters to the consideration of the properties of iron and steel, two to elementary mechanics, one to the subject of foundations, and one to the painting of steel structures. The remaining five chapters deal more specifically with the design and construction of tanks, although they also contain much of a general and elementary character.

While the engineer will find such subjects as foundations, and iron and steel, much more fully treated in special works, it is certainly convenient to have in concise form such information on these subjects as will be of direct application to this particular field of design. The chapter on painting is valuable and quite in place here, owing to the great lack of information on this important subject. The subject of riveting is quite fully treated, and convenient tables are given for the use of the designer.

In the chapters treating of the principles of mechanics and their applications to the design of the structures under consideration there is much to be criticised. This portion of the book is in fact full of the grossest errors of theory, and were it not for the very absurdity of the mistakes it would be unfortunate for such a book to come into the hands of a young engineer. The treatment of tanks is also very incomplete, no consideration being given to six- or eight-post towers and practically none